

ABSTRACT

2025 Pyrolyzing gasification system and method of use including primary combustion of
non-uniform solid fuels such as biomass and solid wastes within a refractory lined gasifier,
secondary combustion of primary combustion gas within a staged, cyclonic, refractory lined
oxidizer, and heat energy recovery from the oxidized flue gas within an indirect air-to-air all-
ceramic heat exchanger or external combustion engine. Primary combustion occurs at low
2030 substoichiometric air percentages of 10-30 percent and at temperatures below 1000 degrees
F. Secondary combustion is staged and controlled for low NO_x formation and prevention of
formation of CO, hydrocarbons, and VOCs. The gasifier includes a furnace bed segmented
into individual cells, each cell is independently monitored using a ramp temperature probe,
and provided with controlled air injection. Gasifier air injection includes tuyere arrays,
2035 lances, or both. The oxidizer includes three serially aligned stages separated by air injecting
baffles, and ability to adjust the exit air temperature.